REMARKS

I. Introduction

In response to the Office Action dated August 27, 2003, no claims have been cancelled, amended or added. Claims 1-57 remain in the application. Re-examination and re-consideration of the application is requested.

II. Prior Art Rejections

A. The Office Action Rejections

In paragraphs (2)-(3) of the Office Action, claims 1, 3-7, 11, 12, 14-20, 22-26, 30, 31, 33-39, 41-45, 49, 50, and 52-57 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sowar, U.S. Patent No. 5,351,196 (Sowar). In paragraph (4) of the Office Action, claims 2, 8-10, 13, 21, 27-29, 32, 40, 46-48, and 51 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sowar in view of Ji et al., "Machine Interpretation of CAD Data for Manufacturing Applications," ACM published September 1997, pages 264-311 (Ji).

Applicant's attorney respectfully traverses these rejections.

B. The Applicant's Independent Claims

Independent claims 1, 20 and 39 are generally directed to terminating profile sweeps for multiple bodies in a computer-implemented solid modeling system. Claim 1 is representative, and comprises the steps of:

(a) generating a planar profile of one or more curves;

(b) sweeping the profile along a specified path to generate a tool body; and

(c) terminating the swept profile when the tool body interacts with a plurality of blank bodies to a predefined extent.

C. The Sowar Reference

Sowar describes an invention relating to processes for the automatic generation of numerical control (NC) tool paths in a CAD/CAM environment. The present invention operates on mechanical parts described as solid models. The process employs well-defined solid models of the part to be machined and the raw stock from which it will be machined. The volumetric difference between the stock and the part defines the material (delta volumes) that must be cut away during the actual machining process. Delta volumes are solid models, and users (or an expert system) can

subdivide delta volumes into smaller volumes that are consistent with a manufacturing process plan. A delta volume and a user-defined strategy for machining the delta volume are then input to NC algorithms. The algorithms generate NC tool paths that remove as much delta volume material as possible. Tool volumes are automatically generated from NC tool paths to represent the volume traversed by the cutting tool. By subtracting the tool volume from the delta volume, the material that remains to be machined modeled and stored as new delta volumes. The subtraction of the tool volume from the stock defines a new stock model that represents the incremental change in stock when the NC tool path is processed at the machine tool. The process is repeated until all delta volumes have been machined and the part has been manufactured.

D. <u>The Ji Reference</u>

Ji describes machine interpretation of CAD data for manufacturing applications. Machine interpretation of the shape of a component for CAD databases is an important problem in CAD/CAM, computer vision, and intelligent manufacturing. It can be used in CAD/CAM for evaluation of designs, in computer vision for machine recognition and machine inspection of objects, and in intelligent manufacturing for automating and integrating the link between design and manufacturing. This topic has been an active area of research since the late '70s, and a significant number of computational methods have been proposed to identify portions of the geometry of a part having engineering significance (here called "features"). However, each proposed mechanism has been able to solve the problem only for components within a restricted geometric domain (such as polyhedral components), or only for components whose features interact with each other in a restricted manner. The purposes of this article are to review and summarize the development of research on machine recognition of features from CAD data, to discuss the advantages and potential problems of each approach, and to point out some of the promising directions future investigations may take. Since most work in this field has focused on machining features, the article primarily covers those features associated with the manufacturing domain. In order to better understand the state of the art, methods of automated feature recognition are divided into the following categories of methods based on their approach: graph-based, syntactic pattern recognition, rule-based, and volumetric. Within each category we have studied issues such as the definition of features, mechanisms developed for recognition of features, the application scope, and the assumptions made. In addition, the problem is addressed from the perspective of information input requirements and the advantages and disadvantages of boundary representation, constructive solid geometry

(CSG), and 2D drawings with respect to machine recognition of features are examined. Emphasis is placed on the mechanisms for attacking problems associated with interacting features.

D. The Applicant's Invention is Patentable Over the References

The Applicant's invention, as recited in independent claims 1, 20 and 39 is patentable over the references, because it contains limitations not taught by the references.

On the other hand, the Office Action cites Sowar as disclosing all the elements of the Applicant's independent claims, including "generating a planar profile of one or more curves" at col. 3, lines 24-26 and col. 13, lines 9-10, "sweeping the profile along a specified path to generate a tool body" at col. 14, lines 9-12, and "terminating the swept profile when the tool body interacts with a plurality of blank bodies to a predefined extent" at col. 14, lines 36-37 and col. 11, lines 44-60. The Office Action admits that Sowar does not teach "predefined extent"; however, the Office Action states that Sowar teaches z extents are needed to determine start and stop positions for slicing and control (and asserts that this related to predetermined z extent for stopping or terminating the profile) at col. 11, lines 19-27. Therefore, according to the Office Action, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the Sowar' s teaching for utilizing z-extent to stop or terminate the constraint profile by using standard interactive techniques, because it would provide a method for automatically generating finishing tool paths for all or portions of delta volumes in a CAD/CAM environment, as discussed at col. 6, lines 40-42.

Applicant's attorney respectfully disagrees.

For example, with regard to the limitation "sweeping the profile along a specified path to generate a tool body," wherein the profile is a planar profile generated from one or more curves, consider the description found in Sowar at the indicated location:

> Col. 14, lines 9-12 (actually lines 6-12)
> STEP 11. CREATING THE TOOL VOLUME. The next process step, as shown in FIG. 9, is to create a tool volume (14-1) from the NC tool path stored in block 26. A tool volume (23-3) is an exact solid model that represents the total volume of space swept out by the cutting tool during complete traversal of the NC tool path.

The above description in Sowar merely describes the volume of space swept out by a cutting tool. However, this portion of Sowar does not teach or suggest a planar profile generated from one or more curves that is swept along a specified path to generate a tool body.

In another example, with regard to the limitation "terminating the swept profile when the tool body interacts with a plurality of blank bodies to a predefined extent," wherein the profile is a, consider the descriptions found in Sowar at the indicated location:

> Col. 14, lines 36-37 (actually lines 36-45)
> STEP 13. END? If all delta volumes have been removed (15), the process terminates. If more delta volumes remain to be machined, the process is repeated starting with STEP 7, i.e., block 11 of FIG. 9. The process may also be ended with some delta volume left unremoved, for example because the user may have chosen to do so or because that unremoved delta volume cannot be machined. The decision to leave some delta volume unremoved is made in the process plan (step 2 above).
>
> Col. 11, lines 44-60 (actually lines 36-45)
> Substep 10-4. Specify 2-D Constraint Profiles. The user can optionally specify one or more 2-D constraint profiles (block 13-13) to further control where the cutting tool can and cannot go. A constraint profile is used internally in the algorithm to generate a volume. This is done by projecting the constraint profile through the Z-extent of the delta volume (determined in substep 10-2). Constraint volumes intersected with the delta volume define the volume which the tool must stay within. In this embodiment of the algorithm, constraint profiles are identified by the user using standard interactive techniques.
> Substep 10-5. Iterate to Remove Entire Delta Volume. The following substeps 10-6 to 10-13 are repeated until the entire delta volume has been processed, i.e., until the CURRENT.sub.-- DEPTH is below the minimum Z coordinate determined in substep 10-2.

The first one of the above descriptions in Sowar merely describes the removal of delta volumes by machining, and deciding which the machining is completed, while the second one of the above descriptions in Sowar merely describes a constraint profile that controls where a cutting can and cannot go. However, these portions of Sowar do not teach or suggest a planar profile generated from one or more curves that has been swept along a specified path to generate a tool body wherein the swept profile is terminated when the tool body interacts with blank bodies to a predefined extent.

Thus, Sowar does not anticipate Applicant's invention. Moreover, the various elements of Applicant's claimed invention together provide operational advantages over Sowar. In addition, Applicant's invention solves problems not recognized by Sowar.

The Ji reference does not overcome the limitations of the Sowar reference. Recall that Ji was cited only against dependent claims 2, 8-10, 13, 21, 27-29, 32, 40, 46-48 and 51.

Thus, Applicant's attorney submits that independent claims 1, 20 and 39 are allowable over the references. Further, dependent claims 2-10, 22-30, and 32-40 are submitted to be allowable over

the references in the same manner, because they are dependent on independent claims 1, 20 and 39, respectively, and thus contain all the limitations of the independent claims. In addition, dependent claims 2-10, 22-30, and 32-40 recite additional novel elements not shown by the references.

III. Conclusion

In view of the above, it is submitted that this application is now in good order for allowance and such allowance is respectfully solicited. Should the Examiner believe minor matters still remain that can be resolved in a telephone interview, the Examiner is urged to call Applicant's undersigned attorney.

Respectfully submitted,

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